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CHEMICAL PROCESSING DEPARTMENT MONTHLY REPORT

MAY, 1961

JUNE 21, 1961

HANFORD ATOMIC PRODUCTS OPERATION

RICHLAND, WASHINGTON

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54 pages.

CHEMICAL PROCESSING DEPARTMENT
MONTHLY REPORT
FOR

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MAY, 1961

Compiled By
OPERATION MANAGERS

June 21, 1961

By Authority of CG-PR-2

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HANFORD ATOMIC PRODUCTS OPERATION
RICHLAND, WASHINGTON

Work performed under Contract No. AT(45-1)-1350 between
the Atomic Energy Commission and General Electric Company.

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CHEMICAL PROCESSING DEPARTMENT
MONTHLY REPORT

MAY, 1961

I. SUMMARY

Production through May, as compared with the April 25, 1961 HAPO Production Forecast (HW-69228), is summarized below:

	<u>Percent of Forecast Achieved</u>	
	<u>May</u>	<u>Fiscal Year To-Date</u>
Separated plutonium nitrate	91.7	99.1
Separated uranium nitrate	98.7	99.0
Uranium oxide	79.5	96.0
Plutonium metal buttons	65.8	95.5
Fabricated parts	41.7	77.6

The May production of plutonium nitrate and uranium nitrate was below that forecasted because of the decision to shutdown Redox as a precautionary measure for criticality control. The shutdown was originally scheduled for June; however, erratic process performance indicated the need for earlier attention. Subsequent flushing successfully removed foreign materials, which were adversely affecting performance, but recovered only 179 grams of plutonium. The latter represented one of the lowest recoveries on record and indicated that the plutonium deposition problem at Redox has remained under good control. A neptunium recovery run, the most successful to-date, was also completed during the shutdown and yielded almost 1.0 kilogram of product.

Uranium oxide production was restricted by feed shortages and by outages on two calciners for mechanical repairs.

Plutonium metal button production was below that forecasted for May, partially caused by feed shortage early in the month but subsequently influenced more by material recycled from plutonium fabrication.

The production of fabricated parts was below that forecasted for May because of emphasis on development effort which will lead to a solution of the dimensional stability problem. Consequently, the production schedule is currently subordinate to this effort, but plans have been made to deliver as many fabricated parts as possible within the framework of the development program.

Approximately 135 kilocuries of strontium-90 were isolated in the Purex plant and stored for further decay of strontium-89.

After establishing optimum operating conditions following startup, the new scrub cartridge in the Purex co-decontamination cycle column gave better decontamination performance than the old cartridge by a factor of two to four.

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Increased neptunium losses, as well as below normal decontamination across the second uranium cycle, were attributed to failure of the plastic plates in the second cycle uranium extraction column. This equipment is scheduled for replacement during the next plant shutdown.

One uranium oxide calciner recently completed 9737 hours of on-line operation, during which approximately 3,000 tons of uranium were processed, before being removed from service for minor maintenance repairs.

On May 12, the Atomic Energy Commission authorized \$685,000 for the General Electric Company to provide equipment additions and replacements for improving the operating reliability of the Purex plant.

A project proposal, requesting \$610,000 total construction funds for NPR Fuels Processing Facilities - 200-West Area, was transmitted to the AEC for approval on May 13.

P. H. Leinker

General Manager
Chemical Processing Department

CHEMICAL PROCESSING DEPARTMENT
MONTHLY REPORT

MAY 1961

II. ACHIEVEMENTS

A. Production Statistics

a. Percent of Forecast (1) Achieved

	<u>May</u>	<u>Fiscal Year To Date</u>
Separated plutonium nitrate	91.72	99.12
Separated uranium nitrate	98.70	99.04
Uranium oxide	79.53	96.00
Plutonium metal buttons	65.77	95.53
Fabricated parts	41.65	77.55

b. Purex

	<u>May</u>	<u>April</u>
Uranium nitrate produced (tons)	694.95	360.76
Average production rate during operation (T/D)	25.6	23.4
Total waste loss (%)		
Plutonium	0.25	0.58
Uranium	0.09	0.35
On-line efficiency (%)	87.6	72.0

c. Redox

Uranium nitrate produced (tons)	69.55	105.01
Average production rate during operation (T/D)	7.0	7.6
Total waste loss (%)		
Plutonium	0.19	0.26
Uranium	0.14	0.11
On-line efficiency (%)	45.7	69.1

d. Uranium Reduction (tons)

Normal UO ₃ loaded	343.8	631.1
Enriched UO ₃ loaded	98.5	68.5
Normal UO ₃ approved for shipment	454.75	605.93
Enriched UO ₃ approved for shipment	96.75	48.67
Normal UO ₃ shipped	656.11	456.12
Enriched UO ₃ shipped	49.17	144.37
Normal UNH backlog	380	42
Enriched UNH backlog	48	88

(1) HW-69228, "HAPO Production Forecast", dated April 25, 1961.

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e. Plutonium Metal Processing

	<u>May</u>	<u>April</u>
Input to Task I (batches)	238	214
Reduction yield (%)	98.89	97.9
Product recovery output (Kgs)	61.47	69.5
Product recovery backlog (Kgs)	446.1	380.8
Waste disposal (grams)	556	758

f. Power

	<u>200-East</u>	<u>200-West</u>
Raw water pumped (gpm)	10 648	4 174
Filtered water pumped (gpm)	1 250	902
Maximum steam generated (lbs./hr.)	280 000	170 000
Average steam generated (lbs./hr.)	213 000	70 817
Total steam generated (M lbs.)	158 493	52 815
Coal consumed (est. tons)	7 989	2 863

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J. H. Warren
Manager - Production

CHEMICAL PROCESSING DEPARTMENT
PUREX OPERATION

May, 1961

II. ACHIEVEMENTS (Continued)

B. PUREX OPERATION

1. Operating Continuity

The plant operated at a 2.7 CF following the startup on April 29. A run of specially irradiated metal was processed for non-representative plutonium for civilian application. A severe gamma burst throughout the process occurred shortly after starting the backcycle flow due to unfamiliar operating characteristics of the new stainless scrub cartridge in the HA (co-decontamination) column. Uranium and plutonium were recycled from May 1 to May 5 to reduce the activity of process streams.

Rates were raised to 3.0 CF on May 4 and later were gradually increased to 3.3 CF. "Cold" uranium was recycled for 15 hours on May 12 during the transition from special production to normal production.

A plant shutdown of three hours and twenty minutes resulted from an unscheduled power outage on May 25. The failure of the HAF (co-decontamination cycle feed) pump on May 30 resulted in a seven-hour shutdown.

All uranium batches produced after May 4 and all but one plutonium batch met shipping specifications. Waste losses were better than normal.

2. Processing Experience

The operating characteristics of the HA (co-decontamination) column with the newly installed stainless steel scrub cartridge were radically different. Shortly after starting the backcycle flow on April 30 a severe gamma burst occurred throughout the process. It was necessary to recycle uranium and plutonium from May 1 to May 5 before process stream activities were reduced.

A production run for the processing of specially irradiated metal feed was completed on May 12. Dissolver heels were removed to conserve as much of this metal as possible. The transition back to normal metal was accomplished without a shutdown. Uranium was recycled for 15 hours while plutonium was essentially stripped from the process for segregation.

The new stainless steel scrub cartridge in the HA (co-decontamination) column began giving a two- to four-fold better decontamination factors than the old cartridge provided in recent months. The

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performance gradually improved as the most effective operating characteristics were developed during the first two weeks of operation. This improvement is believed to result from a gradual aqueous wetting of the new plates, which would give improved performance.

Decontamination across the 2D (second uranium cycle) column was below normal and neptunium losses in the 2DW stream were two- to four-times higher than normal in previous months. Loss of integrity of the plastic plates is the probable cause.

Solvent quality was generally good during the period with gamma activity levels ranging from 1500 to 3000 micro-curies per gallon.

Off-standard uranium batches produced during the plant startup were reworked. Uranium waste from the UO_3 Plant was blended into the uranium cycle feed stream for rework.

The testing of hydrazine as a process reductant in the IBX stream was continued during the period.

Fission product recovery activity consisted of six carbonate runs, four oxalate runs, and two concentration runs resulting in 135 kilocuries of Sr-90. The product from the first series of runs was transferred to the 003 tank and later combined with the material in the 002 tank for feed to the Hot Semiworks. The second product batch was transferred to the 003 tank and is being held there at month's end.

Two cask shipments to the High Level Cells in 300 Area totaled 36.6 kilocuries of Sr-90. The Hot Semiworks received 415 kilocuries of Sr-90 feed from the 002 tank.

The HAPO-1A transfer cask was received from Oak Ridge on May 12 for minor valve handle reorientation before transferring to HLO for reloading. The loaded cask was returned to 200 East Area on May 16 for observation and final closure. It was dispatched to Oak Ridge on June 1.

3. Mechanical Experience

The prototype titanium tube bundle in the H-4 (backcycle) concentrator gave excellent performance. This one tube bundle carried the entire heating load of the concentrator.

The HAF (co-decontamination feed) pump failed on May 30 and was replaced. The recently installed two-piece feed jumper permitted the replacement to be made without stripping and draining the column. The replacement required only four hours but instrument troubles delayed startup an additional three hours.

Three process jumpers were replaced during the month.

The installation of a pump and over-ground piping system was completed for pumping coating waste from 107-C to 108-C tanks. This work was initiated when the overflow line between these tanks became plugged.

Installation of a "top hat" deflector in the 244-CR-002 pump opening was completed with satisfactory results. The deflector is designed to divert all slinger-ring leakage back into the tank.

Three lucite panels of the N Cell hood were replaced using lucite treated with a "Teslar" film (polyvinyl fluoride) to resist corrosion and staining.

Work necessary to provide an instrument air supply to the PR room and N Cell ventilation controls was completed on May 15. The filtered water high tank was drained on May 17 for inspection. The tank was found in good condition.

A diversion box change was made to divert concentrated waste to 106-A tank to preheat the tank for later service. Coating waste was temporarily diverted to 101-C tank and then back to the 107-C tank in connection with plugging of the cascade line, previously mentioned.

4. Radiation Experience

The total radio-iodine 131-emission was 24 curies for the period. The maximum seven-day emission was 6.4 curies.

There were ten Radiation Occurrences and five cases of skin contamination. A sample of the Hot Semiworks Sr-90 process stream gave a maximum dose rate of 5.2 rads/hr. during analysis.

5. Analytical Experience

The new 400-channel analyzer is in use for counting samples with Purex isotopic spectra. Calibrations were completed on nine isotopes on each of the two detector crystals. A large number of geometric factors were determined in order to provide instrument and analytical flexibility. Calibration counting for the IFD isotope spectrum is in progress.

Neptunium recovery studies on composite H2 waste samples were continued.

A plutonium IV valence adjustment was carried out successfully on a composite of the final plutonium product solution. This test proved out the process for reworking plutonium through the ion exchange facility.

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6. Events Influencing Costs

One supervisor in Radiation Monitoring and two Radiation Monitors transferred from FPO to Purex on May 15 in preparation for B Plant reactivation.

The P-J7 large canyon pulser, valued at \$41,000, was decontaminated and reconditioned at a total cost of \$7,857.

Three canyon pumps (K-1, J-5, and G-1-2) valued at \$19,000, were decontaminated and repaired at a total cost of \$9,337.

PR Mc Murray
Manager-Purex

PR McMurray:BAF:gt

CHEMICAL PROCESSING DEPARTMENT
MONTHLY REPORT

MAY, 1961

II. ACHIEVEMENTS

C. SPECIAL SEPARATION PROCESSING AND AUXILIARIES OPERATION

1. Operating Continuity

Processing of E-metal in the Redox Plant was interrupted for the first two weeks of the month to permit a neptunium recovery run and to flush process equipment with 60 percent nitric acid as a critical mass control measure. A total of 979 grams of neptunium was recovered, representing an 88 percent recovery, the best experienced to date. The acid flush showed no abnormal deposition of plutonium in process equipment with only 194 grams recovered. E-metal processing was resumed on May 15 and continued as scheduled through the end of the month.

2. Processing Operation

The fifth neptunium recovery run processed in the Redox Plant was completed during the first week of the month. A total of 979 grams of the estimated 1,110 grams accumulated was recovered without incident and sent to the Process Chemistry Operation in the 222-S Building for final purification and isolation.

The second week of the month was used for a 60 percent nitric acid flush of the processing equipment in both the 202-S Canyon Building and the 233-S Concentration Building, for criticality control. No abnormal plutonium hold-ups in the processing equipment were disclosed. The total plutonium recovery for the two buildings was only 194 grams, 79 grams from the 202-S Building and 115 grams from the 233-S Building. This small recovery indicates that the plutonium deposition problem has remained under good control since the last acid flush which was processed during January, 1961.

Dissolving of E-metal was resumed on 5-10-61 and feed to the extraction columns was started on 5-15-61. Processing continued as scheduled for the balance of the month.

Approximately 173 tons of UNH, with a high gamma ratio, were received from the Purex Plant and reprocessed through the silica gel system to reduce the gamma content to within shipping specifications.

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A forty minute power outage was experienced on 5-25-61 when lightning struck a section of the Bonneville Power loop. Processing operations were immediately terminated. No process upsets or equipment damage resulted and the plant was back on line in approximately four hours.

3. Mechanical Experience

The agitator in the D-2 crib sampling tank failed on 5-3-61 after 23,367 hours of nearly continuous operation (originally installed on 5-10-58). This was a special agitator developed by Process Equipment Development, Hanford Laboratories Operation, and was a direct drive, 215 rpm, 10 horsepower, with a hollow shaft four inches in diameter. Although the failed unit was replaced with a conventional agitator, the unusually long service of the experimental unit will undoubtedly result in future agitator purchases being of this design.

The plutonium ozonator transfer pump (E-2 pogo pump) failed on 5-15-61 due to a weakened foot valve spring. The unit was replaced on 5-16-61. During startup reduced pump delivery rates were encountered, but minor adjustments resolved this problem and the unit is now operating satisfactorily.

The D-14 backcycle concentrator pump failed on 5-31-61 and was replaced with a reconditioned unit. The failed unit had been in operation since 1-9-60 and had 4,798 hours of operating time.

The F-2 concentrator tower and the F-3 condenser in the process feed concentrator system were both replaced on 5-26-61. The replacements were necessary because of excessive air in-leakage at the vapor line flanges at the top of the tower and the condenser. This condition caused poor vacuum and thus limited the capacity of the F-2 condenser. Previous efforts to reduce the leakage by using "C" clamps were unsatisfactory.

Piping changes were made this month in the chemical storage area which will permit the storage of adequate nitric acid to breach the February, March, and April, 1962 no-shipping schedule of the California Chemical Company. The system is now ready and will be placed in service in the immediate future.

Six jumpers were replaced in the 202-S Canyon during the month, two because of defective heads and four because of electrical malfunctioning.

4. Waste Handling and Decontamination

The two off-site fuel shipping casks received during April (14 and 16 tons, respectively) were completely disassembled, decontaminated, reassembled, and released to the Irradiation Processing Department on 5-23-61. Exterior radiation readings were reduced from 3.5 rads to less than 100 c/m, non-smearable.

Cell 7-L in the 221-B Canyon Building was stripped and decontaminated at a cost of approximately \$2,000. This work was done for the Facilities Engineering Operation so that conditions could be more firmly evaluated prior to scoping the costs for Project CG-897. Radiation readings were reduced from 50 rad to a general level of 700 mrad. With the proposed shielding, working time limits are expected to be in the range of six to eight hours.

Equipment valued at approximately \$50,000 was received from the processing plants for decontamination, repair or inspection during the month. Equipment valued at \$134,000 was returned to customers. A savings of approximately \$85,000 over the cost of new replacement equipment was realized through the equipment decontamination program during the month.

A total of 221 man-hours was charged to the decontamination of railroad, automotive, and heavy equipment. The following is a breakdown of the major items decontaminated:

<u>Item</u>	<u>Operation Charged</u>
Locomotives No. 31 & 32	Transportation
Well Cars No. 39 & 41	CPD
Truck Tractor No. 68-E-9303 (for excess)	P&GM
Electrical Distribution Truck No. 68-B-5864	CE&UO
D-8 Caterpillar	P&GM
Light Plants No. 3292 & 3293 (for excess)	P&GM
5-Ton Chain Hoist	IPD
Rear Face Piping (4 pieces)	IPD
Vertical Control Rods	IPD
Well Cars No. 36, 40 & 44 (repaired)	CPD

5. Radiation Experience

Ten skin contamination cases and seven radiation occurrences were recorded during the month. All skin contamination was readily reduced to non-detectable. The most significant of the radiation occurrences resulted in two skin contamination

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cases and one personal clothing contamination case, none of which were serious.

Ruthenium contamination in the Redox canyon continues to be a problem each time steps are taken to prepare for burial of the obsolete equipment which was used in the old ruthenium volatilization process. On May 7 contamination was spread to the canyon and crane during efforts to place an old tube bundle in an equipment transfer capsule. Considerable effort has been and will be required to get back to normal. Six solvent decontamination assaults on the crane have reduced radiation levels to less than two-fold above normal. Further decontamination is planned, but in the meantime supplementary flushing nozzles are being fabricated for installation in J-cell to see if additional water flushing will do some good in this area.

Two contaminated equipment moves to the Redox Equipment Reclamation Facility were made during the month. The equipment involved was the failed E-13 ozonator vessel and the D-14 agitator. Both equipment moves were completed without incident.

6. Analytical Experience

The development of an analytical procedure for determining aluminum applicable for use on highly radioactive samples, where only micro amounts can be used for analyses, highlighted the 222-S Analytical Laboratory's work this month. This procedure can be used on the Redox Plant's waste and backcycle streams and will aid in evaluating the salting strength of this material. Previously this analysis could be performed only on equipment not available to this laboratory and only on a semi-quantitative basis.

Another significant improvement was the development of a flame spectrophotometer method for the analysis of calcium. This procedure is important in checking the specification analyses of the uranium product. Since it is difficult to avoid calcium contamination it is important to have a procedure which provides a good check on emission spectrographic results. Although numerous elements interfere with the flame method, these can be removed by solvent extraction.

Chas. S. Swinuth
Manager - Special Separation
Processing and Auxiliaries

CHEMICAL PROCESSING DEPARTMENT
MONTHLY REPORT

May, 1961

II. ACHIEVEMENTS (Continued)

D. FINISHED PRODUCTS OPERATION

1. Operating Continuity

Normal fabrication activities were partially curtailed during May in order to utilize the facilities for development work in connection with the dimensional stability problem. Uranium oxide production was restricted by feed shortages and by failure of the shear pins in two calciners. Production of unfabricated plutonium was also restricted during the first week of May because of a limited feed supply. Subsequent production rates were normal. Plutonium recovery operations were interrupted by a scheduled hydrogen fluoride flush of the solvent extraction columns and by a number of minor equipment failures.

2. Processing Operations

a. Plutonium Fabrication

Information on plutonium fabrication activities is presented in Document HW-69883 entitled "Chemical Processing Department, Finished Products Operation, Z Plant Monthly Report, May, 1961," classified "Secret, Atomic Weapon Data, Production and Stockpile Information."

b. Plutonium Processing

Gross production of unfabricated plutonium increased 25 percent over April, reflecting increased feed receipts and fewer operational interruptions. Processing of the non-representative plutonium ordered by the Atomic Energy Commission proceeded smoothly during the early part of the month. Production quality was high and waste losses were low.

With AEC approval, the May 15 shipment of unfabricated plutonium to the customer was postponed in order to provide increased inventories for fabrication activities.

One of the hoods in Room 227 was modified to permit the burning of plutonium metal skulls to obtain plutonium oxide. This has reduced dissolution time cycles and also reduced the hazards associated with the handling and storage of plutonium metal skulls.

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c. Uranium Reduction

Feed shortages and outages on two calciners resulted in limited uranium oxide production during May. Repairs were completed and feed supplies were improved at month end.

3. Mechanical Performance

Plutonium fabrication equipment and plutonium preparation equipment functioned well this month with only routine maintenance and minor repairs required.

Although the control problems on the new Gorton lathes have not been completely eliminated, some improvements have been made. These improvements will be incorporated on all the lathes as these machines will be required for production work early in fiscal year 1962. At the same time, piping modifications recommended by the General Engineering Laboratory will be made. Work on these items is approximately 50 percent complete.

Recovery equipment continued to require excessive maintenance to control leakage. Plutonium metal dissolver pots M-1 and M-2 in Hood 42 failed due to corrosion. Replacement of one unit was completed by month end.

In the Uranium Reduction plant, shear pin failures made it necessary to dismantle and renovate the H and M calciners. At month end, repairs to these units and to G calciner, which failed in April, were complete. The X-19 UNH feed pump failed and required replacement during the month.

4. Radiation Experience

Radiation and contamination control statistics indicate satisfactory control during the month.

Three cases of potential plutonium deposition occurred as a result of injuries in Controlled Injury Zones in the 234-5 building. Initial assays indicate that there were no significant depositions in any of the cases.

5. Analytical and Final Inspection Experience

	<u>April</u>	<u>May</u>
Number of Samples Received	1,835	1,521
Number of Determinations	20,631	15,118
Average Impurity, Buttons	1,331 ppm	1,522 ppm
Buttons Rejected	1.7 %	0.5 %

6. Events Influencing Costs

Radiation monitoring coverage on shift at the Uranium Reduction plant was eliminated on May 15. Three Radiation Monitors and one Supervisor, Radiation Monitoring were transferred to assignments outside the Finished Products Operation. The cost reduction associated with this change was approximately \$33,000 per year.

W. J. Gartin
 Manager,
 Finished Products

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CHEMICAL PROCESSING DEPARTMENT
MONTHLY REPORT

May 1961

II. ACHIEVEMENTS (continued)

E. POWER AND GENERAL MAINTENANCE OPERATION

1. Operating Continuity

A complete electrical outage occurred at 6:50 p.m. on May 25 in 200-E and 200-W Areas. The emergency steam generators in both 284-E and 284-W came on the line and functioned normally. Normal power was restored at 7:30 p.m. The outage occurred during a rather severe storm.

2. Inspection, Maintenance and Repair

Mounting and modifying of the buffer for the first Hanford Type 2 Cask, for shipping strontium carbonate, was initiated and is approximately 75 per cent complete. The cask also arrived and is being prepared for use. Preparation includes pouring of Woods metal in the void between the cooling coils and filter chamber and buffing the exterior of the cask for ease in decontamination.

Six steel tie-rods, which are used to position and tie down the buffer container for the Hanford Type IA Strontium Cask to the flatcar, were replaced with high-tensile steel rods, since the original rods had cracked where the nuts were back-welded to them.

Three N Cell Hood Panels and one PR Loadout Hood Panel at Purex were replaced. The N Cell Panels had a thin chemically inert film bonded to them. The intent is to greatly improve the life of the panels by eliminating the chemical attack on the lucite.

A black iron burial capsule for the Redox H-4 Oxidizer Tower was fabricated. The capsule is approximately five feet in diameter by $13\frac{1}{2}$ feet high.

Modifications to the Purex K-2 Column, for making the cartridge remoteable, were completed. Assembly of the remote cartridge was not started.

The insulating and stainless steel sheathing of Purex Tube Bundles #33 and #34 were completed.

A special 10' x 10' storage tray for use in the Purex canyon was completed, except for sandblasting and painting.

Three lucite hood panels were installed in room 179-C, and hood alterations plus new panels were installed in hood 227 at Z Plant.

A Pogo-Stick Pump for a Redox jumper was made on a rush basis.

A new 20-inch-diameter Monarch Precision Lathe for the Tool and Die Shop was received and is in the process of being installed.

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Twenty-one jumpers were fabricated during the month, five of these being on a rush basis.

An H-4 Helical Tube Bundle was completed and is to be placed in Spare Parts.

A large stainless steel dipping rack for decontamination of connector heads, nozzles, valves, rotometers, etc., at T Plant, was fabricated and delivered.

Testing of the new Hypalon rings in a centrifuge drive head was completed, with the results being studied by the Bird Manufacturing Company representative.

A special supernate pump for use in the Purex Tank Farm was mocked up and made ready for use on a rush basis.

Installation of the chip hood and associated equipment in Cell 5 of the 231-Z Building was completed.

Work done in the 241-TX Tank Farms during the month consisted of: removing an air sparger from tank 103, removing a 38' pump from tank 102 and setting it in tank 103, and pulling and inspecting a Johnson pump in the 101 tank. The regulated motor crane and associated equipment was used in the 241-CR Farm to pull the pump from the 107-C tank and install a three-foot extension spool. Another job in the 241-CR Tank Farm was the removal of the pump in the 002 vault and the installation of a splash shield on the pump, so that any spillage from the pump would return to the tank rather than to the vault. On the latter job, a closed-circuit TV unit was advantageously used to observe the repositioning of the pump. By monitoring the TV receiver at a remote location, information as to the location of the crane hook was relayed to the crane operator by use of a portable radio transmitter.

Section forces painted the interior of a tanker trailer used by Hanford Laboratories for the hauling of low-level laboratory wastes. After the interior was decontaminated at the T Facility, rust was removed and five coats of Amercoat #55 was applied. Radiation levels were high, and in some portions of the trailer workmen were allotted only five minutes. Fresh-air masks were used and safety precautions were followed closely.

A break in the eight-inch chemical sewer line by Purex required removal of acid-saturated dirt and special support for a nearby tank during the repair.

Maintenance support was provided to the Hanford Laboratories Operation in the reactivation and start-up of the Hot Semiworks.

The old wooden lockers in the 2707-E and 2707-W Change Houses have been replaced with new metal lockers. Also, new lunch tables with attachable seats have been installed.

A bad leak occurred in the 20" raw-water line to Redox at 6 a.m. on May 4, 1961. The joint was recaulked, and normal service was restored by 6 p.m. of the same day.

On May 9, the voltage meter on the electrical panel in 284-W Building showed one phase grounded. The trouble was found to be near Redox, and normal service was restored on May 10.

The sanitary water storage high-tanks at Purex (2901-A) and 284-E Building (2901-E) were inspected during the month. The Purex high-tank was in excellent condition. The 2901-E high-tank is in need of maintenance.

Ventilation balance activities included the following: final air balance on 105-KE and 105-KW reactor buildings; adjusting air volumes after changing of high-efficiency filters in the exhaust system of 233-S Building; and providing ventilation services to facilitate panel changes on Hood 6 in 234-5 Building.

T. S. La Follette

Manager
Power & General Maintenance

TGL:ap

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CHEMICAL PROCESSING DEPARTMENT
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II. ACHIEVEMENTS (continued)

F. FACILITIES ENGINEERING OPERATION

1. Purex

a. Process Design and Development Engineering

Enriched Metal Processing

Two methods of providing backcycle waste solution storage capacity for Purex have been reviewed and determined to be feasible; a tank in the F4 canyon position, and an outside storage vault.

Product Monitor - LBXP Stream

The installation of the prototype neutron counter was completed and the initial operation was satisfactory. It then became inoperable due to moisture shorting out connections in the jumper electrical connector. Examination of the jumper is scheduled to determine the extent of the trouble.

b. Project Engineering

CGC-895 - Reliability Improvements - Purex

On May 12, 1961, Directive No. HW-512, Mod. No. 1, authorized \$685,000 for improving the operating reliability of Purex.

CAC-928 - Leak Detection - High-level Waste Tanks - 241-A and 241-SX

On May 25, the AEC authorized \$20,000 to the General Electric Company for performance of Title I and II work and related management services.

c. Manufacturing Engineering

H4 Titanium Concentrator Tube Bundle

The new titanium tube bundle for the Purex H-H4 concentrator, installed during the week of April 17, 1961, was in continuous production service during the month of May. To date, performance of the titanium bundle has been

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excellent. For roughly half the month, the titanium bundle provided the entire boilup duty at 3.0 to 3.2 CF with the companion stainless bundle shut off. For the past three weeks, the over-all coefficient of heat transfer for the titanium bundle has been in the range of 500 to 550 BTU/hour degree F. square feet (outside area).

Diversion Box TV Coverage

Twice during the month, closed circuit television was used to view and control crane operations at a diversion box at the 241-A Tank Farm. By controlling the crane from inside a valve pit, the normal radiation exposure of 200 mr/hour was eliminated while moving cover blocks and changing jumpers. This experience has resulted in the scheduling of television viewing for the next jumper changes.

2. Special Separations Processing

a. Process Design and Development Engineering

Radiation Monitor and Canyon Crane

Design was completed for mounting three gamma radiation detectors on the Redox canyon crane, with a wide-range readout instrument in the cab. Procurement of equipment was started.

3. Finished Products Operation

a. Process Design and Development Engineering

Gorton Lathes

Modifications to four of the six Gorton lathes are being made by CPD forces. The modifications include electrical isolation of control system, replacing non-shielded wiring in certain critical areas with shielded wire, revisions to spindle and table speed control, revisions to piping from servo-valve to tracer cylinder and installation of accumulators, and miscellaneous wiring changes. Upon completion of these modifications, engineering testing will be resumed on one machine.

Fourth Feed Concentrator Installation

Definitive process design work was completed and a summary report written, covering the installation of a fourth concentrator for the UO₃ Plant.

Skull Burning Equipment

Equipment for skull burning in the unused portion of the Room 227 glove box, was designed, fabricated, and installed during the month. Operation to date has been satisfactory. Scoping work has been completed and detail design will start about June 1, for a prototypical glove box to house equipment for testing new methods of dissolving.

Hazards Evaluations

An engineering study was completed and documented during the month on what the plutonium emission rates from the building stack would be for various incidents in the 234-5 Building.

b. Project Engineering

CGC-813 - Plutonium Recovery from Contaminated Material-234-5 Building

Acceptance tests are in progress. All major equipment has been received. The final settlement claim for the payment of the incinerator is in the process of negotiation.

CAC-880 - Pu Reclamation Facility-"Z" Plant

By Work Authority (CAC-880)(5), dated April 21, 1961, funds for this work were increased by \$41,000 to a total of \$1,431,000.

CGC-912 - Waste Treatment Facility - "Z" Plant

A fixed price contract was awarded by the ABC on May 18, for Phase I construction of the building. Contract amount was \$62,390. Detail design of this facility is on schedule with an actual progress of 98 percent complete. Electrical service tie-ins for use of the contractor are completed.

4. General

a. Process Design and Development Engineering

NPR Casks and Cars

Preliminary drawings and criteria for the NPR shipping casks and cars are being reviewed. A complete nuclear safety review is being made. Present plans are to purchase two cars and six casks.

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b. Project Engineering

Project Cost Information as of May 21, 1961:

Total Authorized Funds - 12 active projects	\$ 9,326,000
Total Cost-to-date	5,472,000
Commitments and Open Work Releases	458,000
Unencumbered Balance	3,396,000
Costs charged to above projects (4/23/61 to 5/21/61)	144,783

AR 61-CPD-17 - SR-90 Carbonate Cask

The first HAPO II cask (fabricated by J. A. Jones Company) arrived on-site from Knapp-Mills on May 29, 1961. Inspection and final assembly of the cask was started on this date. Fabrication of the second cask at Knapp-Mills is in the final completion stages and shipment is scheduled for early June.

H. P. Shaw
H. P. Shaw, Manager
Facilities Engineering Operation
CHEMICAL PROCESSING DEPARTMENT

HP Shaw/WWC/alr

CHEMICAL PROCESSING DEPARTMENT
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II. ACHIEVEMENTS (Continued)

G. RESEARCH AND ENGINEERING OPERATION

1. Purex Process Technology -

a. Fission Product Recovery

Temperature measurements taken after the second loading of the HAP0 1A Cask (an annular Decalso ion exchange bed loaded with 25,000 curies of purified strontium-90) essentially duplicated those from the first loading with a 10 degree F differential between the interior and exterior temperatures. However, whereas the first loading reached an equilibrium pressure of 80 psig, the pressure continued to increase and reached 90 psig after five days. When the cask was resealed, after the Decalso had been water washed and the void volume in the cask increased four-fold by the removal of solution, pressure measurements, by extrapolation, indicated that the build-up would not exceed the design limits enroute.

b. Solvent Extraction

Except for an extremely large burst of gamma activity shortly after startup, which was dissipated by operating for four days on recycled uranium, decontamination performance was excellent during the month. A two to three-fold decrease in the intercycle gamma activity resulted from the use of the new six per cent free area, nozzle plate, scrub section cartridge in the HA Column. However, improvement in the final products was somewhat less because of lower decontamination in both final decontamination cycles (lower gamma activity in the feed). The solvent extraction uranium product generally ranged between three and four gamma ratio but was reduced to the ≤ 2.0 specification by silica gel treatment. Except for three initial batches, all the plutonium product met the specification of 2×10^{-11} ZrNb/AT after ion exchange processing.

Plutonium waste losses via the HA Column effluent (HAW) were generally 0.015 per cent or lower. The improved loss performance was attributed to reduced HA Column organic phase uranium saturation and a decrease of 44 per cent in the flow of the scrub stream.

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The addition of hydrazine to the Partitioning Column extractant (IBX) continued to be tested. By month end the IBX-N₂H₄ concentration was 0.05 M and the 0.034 M sulfamic acid, which had been previously added, was eliminated. Although erratic 2A Column plutonium losses have complicated interpretation of the results, preliminary observations include:

- (1) No effect had been noted on plant decontamination performance.
- (2) Hydrazine, above the 0.005 M detection limit, was not found in the plutonium stream from the Partitioning Column (IBP) until the concentration in the IBX reached 0.03 M.
- (3) The plutonium concentration in the 2A Column waste (2AW) has not been significantly reduced by the lower sulfate concentration in the system. However, it is believed that the current plutonium loss is affected by the kinetics of the N₂H₄ - NO₂ reaction in the 2AF Tank.

Other items of interest to solvent extraction were as follows:

- (1) Initial operation of the new HA Column six per cent free area, stainless steel, nozzle plate scrub cartridge was erratic and produced excessive aqueous holdup in the column. Both conditions disappeared with continued usage and improved decontamination performance resulted.
- (2) Sample analyses show a two to three decontamination factor for the HS Column after installation of the new cartridge in the HA Column.
- (3) The ferrous sulfamate addition to the 2D Column feed (2DF) was maintained twice flowsheet because of the deteriorated 2D Column scrub cartridge.
- (4) Startup after an electrical power failure was smooth and without the usual severe gamma activity burst within the plant.

c. Neptunium Recovery

Neptunium recovery in the HA Column was normal (about 75 per cent of the neptunium in the HAF) but holdup in the column varied substantially during the month. From a subnormal holdup, the pattern changed to a large reflux which was unaffected by the following:

- (1) Increasing the nitric acid addition to the top of the HA Column (HSR nitric),
- (2) Increasing the solvent flow to the HA Column scrub section (HAO), and
- (3) Decreasing the organic phase uranium saturation in the column.

The accumulation was removed by stripping the column during startup after a power failure. Holdup at month end appeared to be normal, and some improvement in recovery resulted from the decreased HA Column organic phase uranium saturation.

Neptunium loss to the final uranium product (2DU) averaged seven per cent which is several fold higher than normal. This loss was not significantly affected by increasing the 2D Column water scrub stream (2DS) and reducing the 2D Column feed (2DF) acidity about ten per cent; consequently, it is believed that the loss is caused by the deteriorated condition of the fluorothene plates in the 2D scrub cartridge.

d. Solvent Treatment

A record gamma activity of 1.4×10^5 uc/gal. in the recycled No. 1 system solvent was established when the Solvent Wash Column (IO) interface was purged early in the month. Continued processing rapidly lowered the gamma activity to the 1000 - 3000 uc/gal. range where it remained.

Solvent losses from the No. 1 system which have been three fold above flowsheet were substantially reduced by the following steps:

- (1) The change frequency of the wash solution in the Batch Wash Tank (TK-G1) was reduced from four to three times per day.
- (2) The aqueous carbonate flow through the Turbomixer (TK-G7) was reduced to fifty per cent of the previous rate and is now twenty per cent below flowsheet.
- (3) The IO Column interface purge was reduced from four to once per day.

Despite the loss reduction from the above changes, the solvent losses are still 0.6 per cent of the solvent throughput which is twice the regular loss.

e. Waste Concentration and Acid Recovery

Waste volumes sent to the underground storage tanks averaged 78, 348, 647, and 86 gallons per ton of uranium for neutralized high activity waste (IWW), neutralized IWW after treatment for strontium recovery, solvent washes and cell drainage, respectively.

Because of improper diptube spacing, the flow of bottoms from the No. 2 Waste Concentrator (E-F6) to the feed tank for the No. 1 Waste Concentrator (E-F11) has been erratic and high since installation of the new E-F6 during the last shutdown. The increased flow coupled with plugging E-F11 diptubes have contributed to the high IWW flow during the past month.

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Waste from an additional seventy tons of irradiated uranium was added to TK-241-A-106 as a continuation of the prewarming process prior to storage of boiling waste in the tank.

The bottom sludge temperature of TK-241-A-101 remained at 204 - 206° C during the month. Several incremental increases above the normal operating level were made in the tank before a downward temperature trend was established.

2. Redox Process Technology - M. K. Harmon

a. Dissolving

The program of tests to determine the maximum capacity of the Mark V dissolver was completed during the month. During the testing of the numerous variables (sizes of heel, charge and cut; concentration of acid and rate of acid addition, etc.) it was determined on the basis of one series of three consecutive equal size cuts, that the maximum instantaneous rate was approximately 8 tons of uranium per day when the virgin acid concentration was 60 percent HNO_3 . The maximum sustained rate with virgin acid of this concentration, was found to be 7.2 tons per day. However, due to the recent change in nitric acid vendors, the virgin acid strength has been decreased to 57 percent HNO_3 , and the maximum sustained dissolving capacity will therefore be slightly less than 7.2 tons per day. The exact figure is not yet known since the analysis of the test data is not yet complete.

Since there is no immediate need to run the dissolver at its sustained maximum capacity, operations personnel have been supplied with a standard procedure for routine use which will give a conservative rate of 6.5 tons per day. On the basis of a 7-day week operation of the dissolver, this rate will be adequate to supply the current feed requirements for the solvent extraction battery operating on a 5-day week. The procedure meets all established requirements for safe dissolver operation, and is based on the removal of five 3.2-ton "cuts" for every two charges of 8.1 tons of uranium each, with an equilibrium "heel" of 2 to 4 tons of undissolved metal remaining in the dissolver.

b. Solvent Extraction

Intermittent incipient plutonium reflux in the 1B (U-Pu partition) Column continues to be an item of some concern. Although increasing the ferrous iron concentration of the 1BX (Pu extractant) stream from 0.055 M to 0.072 M gave several extended periods in which no plutonium reflux occurred, results were not reproducible or consistent. Increasing the nitric acid concentration of the 1BS (Pu scrub) stream from 0.15 M to 0.30 M had no effect on the frequency or magnitude of reflux. There is, as yet, no apparent correlation between cause and effect. Process Chemistry personnel have begun an analysis of the operation of the 1A (first cycle decontamination) and 1B Columns in an attempt to determine if the phenomenon constitutes a true problem and if so what process changes will be required to eliminate it.

A 60 percent nitric acid flush of the extraction columns, overflow lines and associated vessels, completed during the month, recovered from this portion of the process equipment only 79 grams of plutonium, one of the lowest recoveries on record. The previous flush completed during January, 1961, recovered 133 grams. The recovery of such a small amount indicates that the plutonium deposition problem remains under good control despite the above-discussed problem

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of the 1B Column, and in fact may be indicative of a lack of any connection between the two phenomena as suspected earlier. (The total recovery of plutonium, including that from the final plutonium product concentration facility (233-S Building) was only 195 grams.) Another 60 percent nitric acid flush is scheduled for September, 1961.

c. Neptunium Recovery

The fifth neptunium recovery run was completed during the month. A total of 979 grams of the estimated 1110 grams accumulated was recovered without incident and sent to the Process Chemistry Operation for final purification and isolation. All process wastes were reworked so that essentially all of the neptunium not removed from the plant was returned to internal recycle. There were no significant irretrievable losses.

Three recovery runs have now been made using the "standard" neptunium recovery flowsheet. The following comparison of the data from these three runs indicates that neptunium recovery is good and flowsheet performance is reproducible.

PRODUCT COMPARISON

	<u>Removal No. 3</u> <u>July-Aug, 1960</u>	<u>Removal No. 4</u> <u>Dec-Jan, 1960-61</u>	<u>Removal No. 5</u> <u>May, 1961</u>
Removal, percent of starting amount	60	80	88
Pu/Np, Gm/Gm	1.8	0.12	0.11
U/Np, Gm/Gm	25	0.002	2×10^{-5}
Gamma/Np Microcuries/Gm	3.3×10^4	3.3×10^3	3.1×10^3

ARITHMETIC FISSION PRODUCT DECONTAMINATION FACTORS

(Dissolver solution contains approximately 1×10^{11} microcuries of gross gamma activity per gram of neptunium.)

<u>Process Step</u>	<u>Removal No. 3</u>	<u>Removal No. 4</u>	<u>Removal No. 5</u>
Accumulation	440	4800	4200
Recycle	25	10	8.5
2nd Extraction Cycle and Partitioning	8	3.8	5.3
3rd Extraction Cycle and Ozonation	35	120	132
Over-all D.F.	3×10^6	3×10^7	3×10^7

d. Waste Storage

The major portion of work on the program proposed last month for further study of wastes stored in the 241-SX waste storage tanks, has been delayed pending agreement on procedures and the resolution of certain difficulties on the transfer of supernatant liquids and core sampling of the solid layer thus exposed. Meanwhile, however, the development of a gamma monitoring probe, which can be inserted into the one-inch-diameter thermo bulb riser to obtain vertical radiation profiles of 241-SX waste storage tanks, is nearly complete. Selected tanks will be monitored with the device during the coming month to determine, if possible, sludge radiation levels and the depths and stratification patterns of the solids.

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3. Finished Products Chemical Technology -

a. Uranium Reduction Operation

1. Concentration and Calcination

One calciner (M-cell) was removed from service after 9737 hours of on-line production service when a routine inspection revealed a broken agitator shear pin guard. It is estimated that approximately 3000 tons of uranium were processed in this calciner since it was last reconditioned during December, 1958 (28 months). The cover of the calciner had not been removed during this period, and only occasional maintenance attention to the shaft seals and to the feed injectors was required. Removal of the powder bed revealed the calciner to be in excellent condition. One failed shear pin was found in addition to the two damaged shear pin guards. UO_3 caking on the agitator and calciner internal surfaces was negligible. Metallurgical examination of the guards indicated fatigue failure due to flexing. The calciner was reconditioned, with the shear pin guards modified to prevent a recurrence of this failure.

Another calciner (H-cell) was reconditioned after 3187 hours of on-line production when a failed shear pin was found during a routine inspection. This calciner was also found to be in excellent condition in all other respects.

b. Metal Finishing Operation

1. Tasks I, II, and III

The plutonium oxalate precipitation process prototypical flow control system was completed with the installation of a continuous discharge type pump (Eco gear pump with teflon gears), a magnetic flowmeter (nominal 0.1-inch inside diameter - teflon bore) with flow controller and control valve, in the plutonium nitrate feed stream, and a feed-oxalic acid ratio controller in the recently installed oxalic acid magnetic flowmeter flow control system. Performance of the system has been excellent, with improved operator control, particularly during start-up, shut-down, and feed concentration changes. Filtrate losses to recovery have been measured at about 0.2 percent.

Task I and II (precipitation, calcination, and hydrofluorination) is normally operated at instantaneous rates up to 1500 grams of plutonium per hour. Rates of 1700, 1800, and 1900 grams per hour have been tested

for seven-hour periods, with no apparent adverse effect on equipment operation or process performance. It is planned to test higher rates to determine the potential capacity of the present process.

2. Recuplex

A hood was modified and equipment installed to permit burning of skulls in air. An oxidation capacity of six to eight kgs of plutonium per day has thus far been demonstrated with the three burning and cooling stations. Conversion to the oxide of currently produced skulls, particularly alpha skulls, reduces the possibility of unpredictable ignition in handling and eliminates the possibility of ignition during skull dissolution operations.

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4. Finished Products Fabrication Technology - . . .

a. Fabrication Operation

1. Foundry

The quality of ingot metal from turnings has improved. The improvement has resulted in an increase of 0.3 grams/cc in average ingot density. The increase in ingot density is attributed to improved equipment and techniques for degreasing, briquetting and melting operations and is reflected in higher casting densities and purity.

Casting efficiency has improved 25 percent. This improvement was primarily due to a reduction in the number of castings rejected prior to machining and a reduction in the number of parts which were recycled without known casting defects. The lower reject rates are attributed to improved equipment and technique.

2. Inspection

Inspection data on HAPO, Rocky Flats and QAIA were provided by Rocky Flats for study. A statistical analysis (by Operations Research and Synthesis personnel) was made to determine measurement errors and part shrinkage for 81-C components. An average shrinkage of about 0.0003 inches per inch was found for both HAPO and Rocky Flats parts. The measurement errors at HAPO, Rocky Flats and QAIA were found to be about an order-of-magnitude larger than can be tolerated for routine production. In addition, about 5 to 10 percent non-random gross errors were found and significant shifting biases were evident between HAPO and QAIA, and Rocky Flats and QAIA.

5. Process Chemistry -

a. Purex Process Assistance1. Solvent Treatment Studies

A silica gel column was set up and tested with Shell E-2342 and plant solvent in an effort to remove undesirable constituents. Although this treatment did remove some constituent as evidenced by an amber color band on the column, no improvement toward chemical degradation was found after the silica gel treatment.

2. Preparation of Hydrazine Stabilized Ferrous Nitrate

Three wrought iron samples were dissolved in a nitric acid-hydrazine mixture to test the preparation of ferrous nitrate stabilized with hydrazine. Complete dissolution of one gram portions of two of the wrought iron samples was effected in 60 minutes at room temperatures in 3.0 M HNO_3 - 0.1 M N_2H_4 . This treatment produced a solution which was 0.36 M Fe, 100% ferrous ion, and stable indefinitely toward oxidation to ferric ion. The results on the third sample were essentially the same except for a small amount (<1.0%) of insoluble material.

b. Neptunium Purification

Two neptunium purification runs were made during the month in which 1395 grams of neptunium was purified and shipped to Savannah River as the nitrate. Run 45 consisted of the purification of 209 grams of neptunium from the Purex plant, contaminated with 478 grams of plutonium, 256 grams of uranium, 1.2 curies of Th^{234} (UX_1), and 10.97 curies of Zr, Nb^{95} . In addition, the run included 252 grams of neptunium in dissolved rejected target elements. Because of the amount of plutonium contamination associated with the Purex material, a two-cycle flowsheet was used. The material was loaded on the anion exchange resin and washed with 10 to 12 column volumes of reducing wash. Following this treatment, the partially purified neptunium was eluted from the column, re-adjusted to feed composition, and the purification completed by a second resin cycle using the standard flowsheet. Decontamination factors across the first and second cycles were, respectively, 43 and 65 for plutonium, 48 and 357 for uranium, 658 and 126 for Zr, Nb^{95} , and 45.4 and 22.5 for UX_1 . The (standard) flowsheet for the second cycle consisted of 10 column volumes of reducing wash and 20 column volumes HF wash. The neptunium waste loss was 1.35 per cent and 0.9 per cent was recycled to run 46. Run 46 consisted of the purification of 980 grams of neptunium from the Redox plant contaminated with 115 grams of plutonium, 13 grams of uranium, 0.014 curies Th^{234} (UX_1), 0.054 curies Zr, Nb^{95} , and 3.51 curies of radioruthenium. The material was purified in the anion exchange facility using 18 column volumes of reducing wash and 18 column volumes of HF wash. Radioruthenium in the purified product was higher than specifications by a factor of 3. The amount

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of plutonium lost to waste was 1.3 per cent. Assay values on the two batches of neptunium nitrate shipped to Savannah River Plant are as follows:

<u>Batch</u>	<u>45</u>	<u>46</u>
Amount shipped	438	957
Np, g/l	35.98	35.18
HNO ₃ , M	3.25	1.24
Pu, % (Np basis)	0.05	0.03
Th, % (Np basis)	0.7	0.1
U, % (Np basis)	0.007	0.003
TMI, % (Np basis)	1.8*	0.17
Zr, Nb, μ c/g Np	0.78	0.42
Ru, μ c/g Np	Not detected	3.07
Th ²³⁴ , μ c/g Np	11.1	4.51

* includes 0.7% aluminum

c. Analytical Assistance

1. X-ray Fluorescence Method for Thorium in Neptunium Oxide

An X-ray fluorescence method has been developed for the determination of thorium in neptunium oxide. The method consists of mixing the NpO₂ with an equal weight of Li₂CO₃, the inert diluent, adding RbNO₃ as an internal standard, and counting the fluorescent X-rays at the emission peaks characteristic of Th and Rb. The ratio of Th counts to Rb counts is compared to a working curve prepared under similar conditions.

6. 234-5 Development - . . .a. Direct Calcination Of Plutonium Nitrate

The reactivity of plutonium dioxide formed in the continuous direct calcination of plutonium nitrate can be improved by sulfate or oxalate additions.

The effect of sulfate or oxalate additions upon PuO_2 reactivity was determined for several mole ratios of plutonium to additive in continuous beaker calcination tests at 250 C. The results of these calcination runs are presented in Table I, which compares the reactivity observed in chlorination tests. Tube furnace chlorination tests indicate that it is possible to produce completely-reactive PuO_2 with either sulfate or oxalate additives. Off-gas considerations make ammonium sulfate the preferable additive. No sulfate is found in the product of chlorination.

Oxide prepared from a solution containing ammonium sulfate was less dense and had a much larger particle size (1000 μ) than oxide prepared from a "standard" feed solution (175 μ). Oxide prepared with an oxalic acid additive, on the other hand, had comparable density but smaller particle size.

The continuous calciner has been readied for a run in which additives will be tested.

TABLE I

EFFECT OF ADDITIVES ON THE REACTIVITY OF PuO_2

<u>Additive</u>	<u>Moles Per Mole Pu</u>	<u>Powder Bulk Density g/cc</u>	<u>Predominant Particle Size, Microns</u>	<u>*Reactivity, Percent Conversion To PuCl_3</u>	
				<u>Tube Furnace</u>	<u>Thermobalance</u>
None	---	5.0	175	63	--
$\text{H}_2\text{C}_2\text{O}_4$	0.2	6.0	75	66	47
$\text{H}_2\text{C}_2\text{O}_4$	1.0	---	75	---	84
$\text{H}_2\text{C}_2\text{O}_4$	1.58	5.0	75	100	98
$(\text{NH}_4)_2\text{SO}_4$	0.2	3.0	800	71	85
$(\text{NH}_4)_2\text{SO}_4$	0.5	2.7	1000	100	85

(*) Tests performed on same size fractions

b. Purification By Chlorination

The removal of impurities during the chlorination of plutonium dioxide was reviewed and additional tests were run. The formation

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of volatile chlorides by phosgene at 500 C results in separation of some impurities. See Table II.

TABLE II

PLUTONIUM PURIFICATION BY CHLORINATION OF PLUTONIUM DIOXIDE

<u>Metallic Impurity</u>	<u>Concentration ppm Based On Pu</u>	<u>B.Pt. Of Trichloride</u>	<u>Separation Factor</u>
Al	10,000	183 C	8
Fe	10,000	315 C	4
Ga	10,000	201 C	1,000

c. Chlorination With Ammonium Chloride

Ammonium chloride is not an effective chlorinating agent for plutonium dioxide at atmospheric pressure at 300 - 320 C.

A test with this solid chlorinating agent was made for one hour at 300 - 320 C in an argon atmosphere. Only 10 percent of the oxide was chlorinated and most of the salt sublimed from the sample.

d. Direct Reduction Of Skulls To Metal

The direct reduction of skulls to metal was shown feasible.

Batch reduction of skulls (93 percent plutonium) was tested by stirring with calcium, calcium chloride, sodium chloride, and magnesium chloride. Yields ranged 80 - 100 percent. Optimum batch size was 600 grams. Two runs per shift appear possible by one person. Further testing of purification and metal consolidation is under way.

e. Ion Exchange Recovery Of Plutonium From Sump Water

The chemical makeup step may be by-passed with little sacrifice in yield.

A run was made in which no chemicals were added to the feed solution. The separation factor for a 2.5-minute residence time in the ion exchange column was 182 (the factor for a chemically-treated feed solution would be approximately 1000). The resin was eluted satisfactorily with 6 M HNO_3 inhibited by 0.3 M sulfamic acid. The elution curve was nearly identical to that for Pu(III) . This surprising result indicates that the plutonium on the resin was Pu(III) .

Manager
Research and Engineering

CHEMICAL PROCESSING DEPARTMENT
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II. ACHIEVEMENTS (continued)

H. FINANCIAL OPERATION

1. Production Cost

Detailed FY 1962 budgets for sections (management levels 3 and 4) were completed and distributed during the month. Work has commenced on allocating the first quarter FY 1962 to months, so that it will be ready for July statements.

Contract and Accounting was furnished with revised "average monthly budget" sheets to cover reallocation of O2 Program funds to HLO Sr-90 as follows:

	<u>Direct Costs</u>	<u>Overheads</u>	<u>Total</u>
May	\$20 000	\$ 8 000	\$28 000
June	<u>20 000</u>	<u>8 000</u>	<u>28 000</u>
Total	<u>\$40 000</u>	<u>\$16 000</u>	<u>\$56 000</u>

We were advised by HOO-AEC that the CPD O3 Program budget submission for FY 1963 had been reduced \$311,000 prior to transmittal to Washington. The decrease results from reducing the fabrication of shapes from our previously budgeted two shift operation to a one shift operation.

CPD's investment in inventories at April 30, 1961 compared with budgeted balances at June 30, 1961 are shown below:

(amounts in thousands)	<u>Balance 4-30-61</u>	<u>Financial Plan 6-30-61</u>	<u>Surplus (Deficit)</u>
<u>Inventories</u>			
Essential Materials	\$ 864	\$ 777	\$ (87)
Spare Parts & Standby	1 715	1 846	131
Special Materials	<u>80</u>	<u>83</u>	<u>3</u>
Gross Inventories	<u>2 659</u>	<u>2 706</u>	<u>47</u>
<u>Reserves</u>			
Essential Materials	52	56	(4)
Spare Parts & Standby	<u>400</u>	<u>461</u>	<u>(61)</u>
Total Reserves	<u>452</u>	<u>517</u>	<u>(65)</u>
Net Investment	<u>\$2 207</u>	<u>\$2 189</u>	<u>\$ (18)</u>

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The chemical essential material physical inventory was observed by Financial personnel on May 31, 1961. A reconciliation and report will be issued in the near future.

A physical inventory of the coal piles in East and West areas was taken on April 27 and 28, 1961. The results indicate a shortage of approximately 2,831 tons (4.6%) compared to book inventory. June operating cost will reflect approximately a \$21,000 charge to adjust the book inventory to physical. The shortage this year is approximately the same amount as the reported overage in the prior year.

Production cost personnel participated in a follow-up meeting regarding elimination of certain nuclear materials balance areas (original meeting reported in April). It now appears possible to eliminate 8 of the 29 areas, reducing clerical effort by both CPD and Nuclear Materials Operation personnel and provide earlier reporting. Also as a result of the meeting, an improved method of determining equivalent production is currently under consideration.

2. General Accounting

As of April 30, 1961, 12 active projects had incurred costs of \$5,349,509 against authorized funds of \$8,711,700. Outstanding commitments totaled \$278,225.

During May six Appropriation Requests, totaling \$23,230, were approved. These authorized the purchase of:

H-5 Filter	Purex	\$12 000
R.R. Car Spotter	P&GM	2 650
Sand Blast Machine	P&GM	2 500
Lodge and Shipley #12 Flo-Turn	R&E	2 480*
Oscilloscope	P&GM	1 800
Paint Spray Unit	P&GM	1 800
Total		<u>\$23 230</u>

* Additional authorization - total amount authorized for the Flo-turn Unit is \$26,480.

In connection with the transfer of T-Plant equipment being used by Decontamination Operation from standby to an in-service status, utility values have been established for this property (valued at \$265,000 compared to first cost of \$745,000). AEC approval will be requested to record and depreciate these assets at their established utility value rather than first cost.

3. Personnel Accounting

A CPD employee was reimbursed retroactive wages in the approximate amount of \$3,000 representing amounts due him for absence resulting from a job sustained injury. The delay in settlement was occasioned

by inability of the State Department of Labor and Industries to determine whether the injury was job incurred.

The Company's right to accept certain cancellations of authorization to deduct union dues has been questioned by the union. Cancellation notices of 28 CPD employees were forwarded to Legal for review.

The retroactive portion of salary increases due union employees, the increase of 3% effective October 3, 1961 for the period to and including April 30, 1961, the date the new contract with HAMTC was ratified, was paid May 19, 1961.

4. Auditing

The report of the audit of CPD property passes was issued during the month. With minor exceptions, activities audited were satisfactory.

The audit report relating to the audit of CPD Cash Working Fund was also issued in May. The activities audited were satisfactory.

Field work was started on an audit of Travel, Living and Entertaining Expense.

A review was made of Walsh-Healy Public Contracts Act as applicable to facilities utilized and working conditions afforded financial personnel. A memorandum was directed to the Specialist-Health, Safety and Radiation and to Power & General Maintenance (landlord) recording minor exceptions noted.

Observations were made of departures of employees from work locations in the 200 East and 200 West areas at the end of day shift and reports issued.

5. Procedures

The new Management Work Order report recently developed was changed from a monthly to a weekly tabulation at the request of field personnel utilizing the report. An educational program is currently being conducted directed mainly to supervisory and foreman levels, for the purpose of assisting them in obtaining maximum benefits from this report. Other HAPO components have expressed a high degree of interest in the report and have requested details.

Manager - Finance

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II. ACHIEVEMENTS (continued)

I. RELATIONS PRACTICES OPERATION

1. Salary Administration

The position level for one exempt position was changed following a revaluation study of a group of positions. The proposed restructuring of a section's organization was reviewed and recommendations were communicated to the manager.

An analysis of the Department's salary position in respect to that of HAPO and the Company as of April 1 was completed. The Chemical Processing Department position has remained relatively unchanged with respect to the General Electric position during the period since Salary Review on those points of comparison usually made, i.e., salary ratio and average level.

2. Personnel Placement

An offer was extended to a Chemical Engineer who will receive his MS degree in August, 1961. Two offers were extended to exempt Aircraft Nuclear Propulsion employees. However, rejections were received from both offers. The Department is transferring one pipefitter and one instrument trainee from Idaho Falls and during June will transfer a Machine Shop Foreman to the Chemical Processing Department.

The Specialist, Personnel Placement attended a technical education conference for the western region sponsored by Engineering Services held at San Jose, California, during the month.

A meeting was attended during the month as contact representative for the Department for the craft training program to be brought up to date on the latest developments of the program and to suggest Department personnel qualified to interview candidates for the training program during the coming month.

3. Wage and Benefits

Retirement papers were completed for one Instrument Technician who retires next month.

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Absence records during the past thirteen months for all Chemical Processing Department employees were reviewed to determine actual practice in the payment of "E" time for absences.

A reduction in the number of suggestions submitted and an increase in the number completed combined to reduce the number of open suggestions to 71. This is the smallest backlog during the year to date and is equivalent to a backlog of only 1.7 months based on average receipts. A summary of other activity during the month is as follows:

	1960 <u>Ave/mo</u>	<u>April</u>	<u>May</u>
Received	38	47	39
Adopted	14	17	24
Awards	\$ 298	\$ 375	\$ 285
Savings	\$ 1866	\$ 707	\$1035

4. Health, Safety, and Radiation

The third in a series of three programs sponsored by the Safety Program Council is in progress at monthly safety meetings. Following the format of a popular TV show paraphrased as "The Price is Wrong", it uses the theme of street and highway safety. Booklets entitled "Deadly Reckoning" prepared by the Traveler's Insurance Company and containing accident data for 1960 are being distributed to each employee at the close of scheduled meetings.

Results of special biological samples obtained from 17 Department personnel in the calendar year to date gave negative deposition results. No additional special biological sampling is planned in any of the cases reported.

5. Communication

Arrangements were made for a series of meetings with monthly salaried employees to discuss the various aspects of the new GE-HAMTC contract. The Manager, Relations Practices, the Specialist, Wage Administration and Benefit Plans and the Union Relations representative from Relations Operation participated in presenting the meetings.

A signed article by K. K. Campbell and P. S. Kingsley, "A Difficult Repair of a Stress Corrosion Failure," has been accepted for publication by Chemical Engineering, and is presently scheduled for an August issue.

for *M. G. Mann*
Manager, Relations Practices

RB Britton:lj

CHEMICAL PROCESSING DEPARTMENT
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III. PERSONNEL ACTIVITIES

A. FORCE SUMMARY

<u>Operation</u>	<u>Monthly Salaried</u>		<u>Weekly Salaried</u>		<u>Total</u>	
	<u>4-30-61</u>	<u>5-31-61</u>	<u>4-30-61</u>	<u>5-31-61</u>	<u>4-30-61</u>	<u>5-31-61</u>
General Manager's Group	11	11	1	1	12	12
Financial	13	13	13	13	26	26
Relations Practices	5	5	6	6	11	11
Research & Engineering	64	64	27	27	91	91
Facilities Engineering	64	65	22	22	86	87
Power and General Maintenance	38	37	237	241	275	278
Production	5	5	3	3	8	8
Special Separation Processing and Auxiliaries	49	49	217	216	266	265
Purex	54	55	213	213	267	268
Finished Products	<u>53</u>	<u>53</u>	<u>235</u>	<u>236</u>	<u>288</u>	<u>289</u>
Total	<u>356</u>	<u>357</u>	<u>974</u>	<u>978</u>	<u>1 330</u>	<u>1 335</u>

B. PERSONNEL CHANGES

Effective May 1, 1961, Mr. A. E. Smith was appointed to the position, Manager-Finished Products Fabrication Technology. Mr. Smith has been acting in this position since March 13, 1961, the date the subsection was established.

Mr. J. R. Goggin, formerly Manager-Shops, Power and General Maintenance Operation, was transferred to the Silicone Products Department, Waterford, New York, effective May 15. On this same date, Mr. C. E. King was transferred from the position, Specialist-Processing Planning and Scheduling, Purex Operation to fill the vacancy, Manager-Shops, created by Mr. Goggin's transfer.

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C. TRIPS

<u>Visitor</u>	<u>To</u>	<u>Nature of Discussion</u>
<u>To Other G.E. Components</u>		
R. S. Rosenfels	GE Research Laboratory Schenectady, N.Y.	Discuss ceramic development. (5/1/61)
	General Engineering Lab. Schenectady, N.Y.	" "
	Lamp Division Cleveland, Ohio	(5/1/61) " "
		(5/3/61)
R. W. Harvey	GE, Oakland, Calif.	Western Regional Meeting Methods and Work Measurement (5/16-17/61)
W. Watson	APED, San Jose, Calif.	Technical Education Conference (5/22-23/61)
M. J. Smith	Computer Dept., Phoenix, Ariz.	Review automated business systems and procedures (5/22-23/61)
	APED, San Jose, Calif.	(5/24/61)
P. H. Reinker	APED, San Jose, Calif.	Organization discussions (5/25/61)
<u>To AEC and Other AEC Contractors</u>		
R. E. Tomlinson V. R. Cooper	AEC, Washington, D.C.	Discussion of californium program. (5/4-5/61)
R. E. Tomlinson	Argonne National Lab. Lemont, Illinois	Discuss plutonium chemistry and waste disposal. (5/8/61)
A. E. Smith	Los Alamos Scientific Lab. Los Alamos, New Mexico Dow Chemical Co. Rocky Flats Plant, Denver, Colorado	Specification and acceptance discussions. (5/11/61) Specification and acceptance discussions. (5/12/61)
A. E. Barber E. F. Kurtz	Dow Chemical Co. Rocky Flats Plant Denver, Colorado	Consultations on Foundry and Shipping. (5/15-16/61)
	Los Alamos Scientific Lab. Los Alamos, New Mexico	Consultations on Foundry (5/17/61)
R. E. Smith J. H. Warren	ORNL, Oak Ridge, Tenn.	Fission product scheduling - combined operations. (5/16-17/61)

<u>Visitor</u>	<u>To</u>	<u>Nature of Discussion</u>
R. E. Smith	Martin Co. Baltimore, Md.	Fission product shipping. (5/18/61)
J. H. Warren	US-AEC, Washington, D.C.	CPD Project consultations. (5/18/61)
A. E. Smith V. R. Cooper W. J. Gartin P. H. Reinker	Los Alamos Scientific Lab. Los Alamos, New Mexico	Discussions on weapons technology and trends. (5/22-23/61)
A. E. Smith V. R. Cooper W. J. Gartin	Dow Chemical Co. Rocky Flats Plant Denver, Colorado	Review and exchange information on fabrication and fabrication development problems. (5/24-25; V.R.Cooper 5/24/61 only)
G. O. Ager	US-AEC, Washington, D.C.	Contractor Safety and Fire Protection conferences. (5/24-25/61)
<u>To General Industry</u>		
R. S. Rosenfels	Carborundum Co. Niagara Falls, N.Y.	Discuss ceramic development. (4/28/61)
	Zirconium Co. of America Cleveland, Ohio	Discuss ceramic development. (5/2/61)
	Laboratory Equipment Corp. St. Joseph, Michigan	Discuss ceramic development. (5/4/61)
	Engineered Ceramic Mfg. Co. Chicago, Illinois	Discuss ceramic development. (5/5/61)
P. S. Kingsley	Electric Steel Foundry Co. Portland, Ore.	Low-carbon 309 SS castings. (5/29/61)
<u>To Conventions & General Meetings</u>		
C. T. Groswith	IBM, Endicott, N.Y.	Materials Systems Mechanization Workshop. (5/1-5/61)
E. R. Irish	Univ. of Wash. Seattle, Wash.	Chemical separations processing. (5/22/61)
I. M. Jacques	Univ. of Wisc. Madison, Wisc.	Seminar-Effective Drafting Management. (5/11-12/61)

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D. VISITORS

<u>Visitor</u>	<u>From</u>	<u>Nature of Discussion</u>
<u>From AEC and AEC Operational Contractors</u>		
R. Schaich	Oak Ridge National Lab. Union Carbide Nuclear Co. Oak Ridge, Tenn.	Fission product recovery. (5/4/61)
W. J. Maraman	Los Alamos Scientific Lab. Los Alamos, New Mexico	Discuss processing of irradiated plutonium. (5/12/61)
D. Karraker M. Davis	E. I. duPont de Nemours Savannah River Plant Aiken, South Carolina	Fission products, waste, and processing plans. (5/12/61)
G. Pleat	U.S.A.E.C. Washington, D.C.	Purex process and fission product recovery. (5/18/61)
W. F. Lennemann	U.S.A.E.C. Washington, D.C.	Fission product recovery and wastes. (5/23/61)
<u>From General Industry</u>		
D. Simmons	Oregon Metallurgical Corp. Albany, Oregon	Tungsten casting and machining. (5/1/61)
Quentin Herwig	The Glidden Co. Portland, Ore.	Protective coating and acid- resistant paints. (5/5/61)
A. V. Santa Lucia	Branson Instruments, Inc. Freemont, Calif.	Ultrasonic cleaning. (5/11/61)
W. P. Keith	W. P. Keith Co. Santa Fe Springs, Calif.	Furnaces for sintering ceramics. (5/10/61)
Wm. Baldwin S. K. Lampson Harvey Lucas Arthur Smith	Allegheny-Ludlum Steel Company Los Angeles, Calif.	Alloy Development-Contract DDR-124 (5/16/61)
H. V. McCormack	Ingersoll-Rand Co. Portland, Oregon	Impact wrench problems. (5/19/61)
R. A. Koffinke	Bird Machine Co. South Walpole, Mass.	Tests of hypalon buffer rings. (5/29-6/2/61)

<u>Visitor</u>	<u>From</u>	<u>Nature of Discussion</u>
<u>From Foreign Government and Agencies</u>		
Dr. Olle Lindstrom	ASEA, Nuclear Power Dept. Vasteras, Sweden	Discuss Swedish plans for reprocessing nuclear fuels. (5/29/61)
<u>From Colleges and Universities</u>		
Dr. E. N. Klemgard	Washington State U Pullman, Wash.	Purex pumps and consultation on bearing problems in rotating equipment. (5/2/61)
<u>From Other Government Agencies</u>		
Capt. A.J.Celick	U.S. Air Force Base, McClellan, Calif.	Tour of Purex facility. (5/10/61)
A. K. Brewer S. A. Newton	U. S. Navy Washington, D. C.	Purex process and fission product recovery. (5/18/61)

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IV. SAFETY AND SECURITY

Operation	Facil. Eng.	Finance	Fin. Prod.	P&GM	Purex	SSP&AO	Prod.	Rel. Prac.	Res.& Eng.	Total CPD	Yr.to Date
Disabling Injuries										0	0
Serious Accidents										0	3
Medical Treatment											
Injuries	1										
Radiation Occur.			9	14	14	7			2	47	217
Contam. Wounds			4	1	10	7			2	24	104
Pu Depositions			1*	1*						2	11
Fires										0	3
Security Violations			1**							1	5
										0	5

* An operator and a sheetmetal worker received plutonium puncture wounds. Both were decontaminated in the Areas and sent to the whole-body monitor for additional checks. The monitor revealed no measurable deposition.

** A primary wiring installation of a 15 kva dry-type transformer broke down causing a short circuit. A momentary rush of current caused the installation to ignite and burn. The damage was \$491.00.

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V. REPORTS

A. PREPARED AND ISSUED

- HW-60772- Rev, Secret, "Critical Mass Control Specification for Vault 174" - by L. M. Meeker, dated May 8, 1961.
- HW-63897, Secret, "NPR Fuels Processing Facilities - 200-W Area - Project CGC-929" - by D. W. McKee, dated April 21, 1961.
- HW-68726, Secret, "Fission Product Concentrates Storage System - 200-E Area - CGC-897, Rev. #1" - by D. W. McKee, dated May 4, 1961.
- HW-68864, Official Use Only, "Secondary Containment Dissolver Off-Gases, Redox and Purex - CGC-930" - by D. W. McKee, dated April 21, 1961.
- HW-69447, Secret, "Isotopic Analysis" - by A. E. Smith, dated May 1, 1961.
- HW-69455, Unclassified, "Budget for FY 1963 and Revised Budget for FY 1962, Proposal for Research and Development - Separations Development - Nuclear and Chemical Safety (02-53-04-02)" - by V. R. Cooper, dated March 1, 1961.
- HW-69474, Secret, "Essential Materials Consumption - Purex, CPD for April, 1961" - by J. E. Lentz, dated May 3, 1961.
- HW-69482- RD, Secret, "Redox Plant Production Schedule - May, 1961" - by D. McDonald, dated May 4, 1961.
- HW-69483- RD, Secret, "Purex Plant Production Schedule - May, 1961" - by D. McDonald, dated May 4, 1961.
- HW-69484- RD, Secret, "UO₃ Plant Production Schedule - May, 1961" - by D. McDonald, dated May 4, 1961.
- HW-69485- RD, Secret, "234-5 Plant Production Schedule - May, 1961" - by D. McDonald, dated May 4, 1961.
- HW-69536, Confidential, "G. E. Purchase Order HIK-888-59850 Master-Universal Wall Thickness Gage" - by A. E. Smith, dated May 9, 1961.

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- HW-69570- RD, Secret, "Hanford Rework Capability" - by H. H. Hopkins, Jr., dated May 26, 1961.
- HW-69586, Unclassified, "Safety Review of Manufacturing Facilities, Chemical Processing Department" - by R. E. Tomlinson, dated May 19, 1961.
- HW-69591, Official Use Only, "Purex Test Program for 1961" - by G. C. Oberg, dated May 15, 1961.
- HW-69596, Secret, "Analysis of Birch Nitrate Batch 45" - by JH Warren, dated May 16, 1961.
- HW-69615, Secret, "Critical Mass Estimate of Stacked Model 81 Castings" - by R. E. Isaacson and R. L. Stevenson, dated May 16, 1961.
- HW-69636, Unclassified, "Trip Report: American Ceramic Society Annual Meeting, Carborundum Company, GERL, GEL, Zirconium Corporation of America, General Electric Lamp Dept., and Laboratory Equipment Corp. - April 23 - May 8, 1961" - by R. S. Rosenfels, dated May 17, 1961.
- HW-69650, Secret, "Impurity Levels in Plutonium Nitrate to Yield Acceptable Metal by Direct Calcination, Hydrofluorination, and Bomb Reduction" - by H. H. Hopkins, Jr., and H. W. Crocker, dated May 18, 1961.
- HW-69653, Secret, "Evaluation of Process Test 61-4 T" - by W. F. Unzicker, dated May 22, 1961.
- HW-69721, Secret, "Progress Report - Finished Products Fabrication Technology Operation, April, 1961" - by Members of FFPTO, Research and Engineering Operation, dated May 24, 1961.

B. PREPARED FOR SIGNATURE AND ISSUANCE

- HW-69442, Secret, "Production - April, 1961" - by W. E. Johnson, May 1, 1961.

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V. PATENT SUMMARY

All persons engaged in work that might reasonably be expected to result in inventions or discoveries advise that, to the best of their knowledge and belief, no inventions or discoveries were made in the course of their work during the period covered by this report except as listed below. Such persons further advise that, for the period therein covered by this report, notebook records, if any, kept in the course of their work have been examined for possible inventions or discoveries.

<u>INVENTOR</u>	<u>TITLE</u>
M. H. Campbell, Purex	Selectively Reducing Valence State VI to IV in a Plutonium IV-VI System in a Nitric Acid Solution.
J. S. Crowder, Power and General Maintenance	Burial of Contaminated Materials - A New Use For Plastic Foams

P. H. Reinker
General Manager
Chemical Processing Department

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**DATE
FILMED
12/23/92**